

cent. zinc oxide. It becomes as hard as horn. A softer mass consists of 50 parts glue, 25 parts wax, and 25 parts glycerine. To prepare the mass, dissolve the glue in warm glycerine, then add the wax, and lastly the metal oxide.

R. Martin, in Sonneberg, mixes 20 to 100 parts zinc oxide with 5 to 10 parts tartaric acid or calcined alum and 100 parts starch (finely powdered), and the required quantity of water to form the casts. If these articles are at a temperature below 15° Celsius and are poured in warm molds, the cast becomes brittle, but is at once made plastic by being placed in a water-bath of 50°. Then give the casts a surface which permits washing by collodion, which is mixed with a solution of wax in ether.

My method of preparing caustic baryta is: Take carbonate baryta, pulverize and mix with charcoal, put in a crucible well luted and expose in a white fire. Then leach with boiled water and let crystallize. As the caustic baryta so greedily absorbs the carbonic acid from the air, I give this simple cheap method, so that your department can often make the caustic baryta new, when the old has turned into carbonate baryta.

I have written these various methods and you can select what pleases you.

I shall be under great obligations to you, if you will send me the survey and publication when ready.

I remain, dear sir, yours very truly,

ANTHONY PIRZ.

Hon. SPENCER F. BAIRD,

Secretary Smithsonian Institution, Washington, D. C.

LIST OF FISHES COLLECTED BY LIEUT. HENRY E. NICHOLS, U. S. N., IN THE GULF OF CALIFORNIA AND ON THE WEST COAST OF LOWER CALIFORNIA, WITH DESCRIPTIONS OF FOUR NEW SPECIES.

By DAVID S. JORDAN and CHARLES H. GILBERT.

The specimens of fishes collected by Lieut. Henry E. Nichols, commandant of the United States Coast and Geodetic Survey Steamer Hassler, in his voyage along the coast of Mexico and Central America, have been already noticed by us on page 225 of the present volume of the Proceedings of the United States National Museum. On the northward voyage of the Hassler (January-March, 1881), Lieutenant Nichols made another collection, also of much importance. A list of the species obtained, with their numbers as recorded in the register of the museum, is given below.

It will be noticed that all the species obtained from the west coast of Lower California belong to the Californian fauna, while nearly all of those obtained within the Gulf are members of the tropical fauna of the west coast of Mexico. It is a fact worthy of note that very few of the

fishes found along the southern coast of California extend their range as far southward as Cape San Lucas or Mazatlan. Only about ten species of shore fishes are known to occur both at San Diego and Mazatlan. In the region between San Diego and Magdalena Bay, the Californian fauna and its characteristic species almost wholly disappear, giving place gradually to the tropical fauna of the west coast of Mexico. Even the *Labridae*, *Pomacentridae*, and *Sciaenidae* of California do not extend southward to Mazatlan.

A.—SPECIES FROM THE GULF OF CALIFORNIA.

29,377. *Serranus radialis* (Quoy & Gaim.) J. & G. Punta San Ignacio, Mexico.

29,388. *Mugil mexicanus* Steind. Same locality.

29,353, 29,363, 29,373. *Tetrodon politus* Ayres. Same locality.

29,362. *Cynoscion parripinne* Ayres. Guaymas, Mexico.

29,386. *Pomadasy? inornatus* (Gill) J. & G. Guaymas, Mexico.

This specimen has 58 scales in a longitudinal series, the dorsal and anal fins almost naked, the anal rays III, 11, and the snout rather long, more than one-third length of head. It differs in all these respects from the description of *Pristipoma brevipinne* Steindachner = ? *Microlepidotus inornatus* Gill.

29,355. *Gerres californiensis* (Gill) J. & G. Guaymas, Mexico.

29,800. *Gerres gracilis* (Gill) J. & G. Guaymas, Mexico.

29,357. *Hemirhamphus unifasciatus* Ranzani. Guaymas, Mexico.

29,356. *Mugil brasiliensis* Agass. Guaymas, Mexico.

29,368. *Porichthys porosissimus* (C. & V.) Gthr. Gulf of California (dredged in 15 fathoms).

29,385. *Cynoscion othonopteron* sp. nov. Punta San Felipe, Mexico.

Description.—Body rather elongate, the back somewhat elevated, the profile from tip of snout to front of dorsal nearly straight; caudal peduncle rather long and slender, its depth 4 in head. Head long and pointed, compressed, not regularly conical. Mouth large, the lower jaw projecting; maxillary broad, reaching to or a little beyond posterior margin of orbit; premaxillaries in front on the level of lower part of pupil; length of gape $2\frac{1}{3}$ in head. Teeth in upper jaw in a moderate band, which becomes narrower laterally; upper jaw with two small canines, their length scarcely one-fourth diameter of pupil; some of the other anterior teeth enlarged, and larger than the lateral teeth. Teeth in lower jaw in a narrow band in front, in a single series laterally; the lateral teeth much larger than the anterior. Eye moderate, broader than preorbital, narrower than maxillary; its diameter $6\frac{2}{3}$ in head, a little more than half interorbital space. Preopercle with its membranaceous border broad, and covered with small scales. Gill-rakers long and strong, nearly as long as eye. Scales small, all with conspicuous membranaceous edges. All the fins excepting spinous dorsal completely covered with small scales, the bases of the fins thickened by

them; a few scales on front of spinous dorsal. Lateral line considerably curved anteriorly, becoming straight at a point in front of the vent, near the origin of the soft dorsal. Dorsal spines comparatively long and strong, little flexible; the third spine slightly longer than the second, $2\frac{3}{4}$ in length of head; first spine short and slender, about $\frac{1}{3}$ length of second. Dorsals not connected; second dorsal rather high, its longest rays $3\frac{1}{2}$ in head. Caudal fin large, *lunate*, the outer rays about $\frac{1}{4}$ longer than the middle rays, which are $2\frac{1}{4}$ in head. (In *C. squamipinne* the caudal fin is rhombic, having the middle rays produced, much longer than the outer rays.) Anal large, as long as high, its distal margin perfectly straight; its longest rays about one-third length of head. Anal spines small, enveloped in the scaly skin, the second about $\frac{1}{3}$ height of first soft ray. Anal fin terminating considerably in front of dorsal. Ventrals long, not reaching quite half way to vent, their length about half that of head. Pectorals broad, rather long, reaching a little beyond tips of ventrals, and contained $1\frac{3}{4}$ in length of head. Head $3\frac{1}{10}$ in length; depth 4. D. IX-I, 23; A. II, 10; Lat. I. 66 (pores 60).

Slaty bluish above, silvery below, with bright reflections; body and fins everywhere with dark punctulations; tip of chin dark; fins yellowish, the upper all with dark edging; pectorals blackish on the posterior side; the axil and the large axillary scale dusky; lower jaw bright silvery; lining of opercle dark; peritoneum pale.

A single large specimen, 23 inches long, was taken at Punta San Felipe, Mexico. Lieutenant Nichols notes that it is very abundant in that locality.

This species agrees with *C. squamipinne*, and differs from all other known species of the genus in the complete squamation of the fins.

29,366. *Stolephorus opercularis* sp. nov. Punta San Felipe.

Allied to *S. macrolepidotus* (Kuer & Steindachner).

Body elliptical, rather short and deep, compressed, but not very strongly so, more elongate than in *S. macrolepidotus*; dorsal outline evenly curved; belly compressed, not trenchant. Apparently *not* translucent in life.

Head large, compressed, the snout bluntish, overlapping the lower jaw, the tip of which is just in front of the eye; maxillary comparatively short and slender, not extending backward to mandibular joint or to margin of preopercle. Maxillary with extremely fine, hardly perceptible teeth; mandible toothless.

Cheeks forming a triangular area, the apex downward and backward, the triangle lower and much broader than usual, the base (at the eye) being four-fifths the length of the other sides. Eye moderate, $1\frac{2}{3}$ in length of cheeks, much longer than snout, 4 in head. Anterior ridge of preopercle prominent, the posterior membranaceous edge little conspicuous. Opercular region unusually long; distance from ridge of preopercle at lower posterior angle of cheeks backward to gill-opening

equal to distance from same point forward to middle of eye. Length of opercle, from anterior ridge of preopercle, three-fourths its greatest height.

Insertion of dorsal midway between base of caudal and middle of eye [caudal and dorsal fins nearly destroyed in type]; anal comparatively short and posterior, its insertion midway between gill-opening and base of caudal, its rays between 20 and 24 in number [two or three of the posterior rays destroyed by a string which has been tied around the tail in the type specimen]. Anal fin with a large scaly sheath. Ventrals small, inserted midway between base of caudal and front of eye. Pectorals short, not reaching ventrals.

Scales large, rather adherent [those on anterior part of body lost]; about 8 in a vertical series from last ray of dorsal to anal.

Head 3 in length; depth, 4. Anal rays about 23.

Color, bluish above; middle line of back dark; sides and below bright silvery, the cheeks and opercles especially so; no trace of lateral silvery stripe.

The type of this species, 5 inches in length, was taken from the stomach of a specimen of *Cynoscion othonopterus* at Punta San Felipe, Mexico. It has suffered somewhat from the digestive process, but the head is in perfect preservation, and all points essential to the description can be readily made out. This species seems to us most closely related, among described species, to *S. macrolepidotus*, from which it differs in very many respects.

29,372. *Caulolatilus princeps* (Jenyns) Gill. Punta Santa Teresa (in deep water).

29,370. *Balistes polylepis* Steind. Same locality.

29,382. *Opisthognathus rhomaleus* sp. nov. Santa Maria.

(Subgenus *Gnathypops* Gill; allied to *Gnathypops papuensis* Bleeker.)

Body rather robust, compressed; head very large, ovoid, thicker and deeper than body, with swollen cheeks, the occipital region high, the snout somewhat truncate, the intermediate profile forming a nearly even curve; greatest depth of head equal to its thickness and two-thirds its length. Eye not very large, 6 in head, longer than snout, about equal to the width of the flattish interorbital space.

Mouth large, the maxillary extending well beyond eye, but not to the margin of the preopercle nor to the mandibular joint, its posterior margin truncate; supplemental bone small, but distinct; length of maxillary from end of snout $1\frac{3}{4}$ in head. Teeth moderate, in both jaws, in broad bands which become narrow on the sides; outer series of teeth somewhat enlarged, especially in upper jaw: one rather small, blunt tooth on middle of vomer. Gill-membranes scarcely connected.

Head naked. Scales on body small, smooth, somewhat imbedded; breast naked. Lateral line indistinct, ceasing opposite anterior third of second dorsal; 103 scales in a longitudinal series from head to caudal.

Dorsal fin high; a rather deep notch separating the spines from the soft rays; the longest spines 3 in length of head, more than half longer than the last spine, and scarcely lower than the soft rays. Insertion of dorsal opposite tip of the bony opercle, the opercular flap extending to opposite the third spine. Caudal fin rounded, about half length of head. Anal higher than soft dorsal, its longest rays $2\frac{1}{4}$ in head. Ventrals large, close together, inserted in front of pectoral, $1\frac{1}{5}$ in head. Pectorals short and broad, $1\frac{1}{5}$ in head.

Head $2\frac{2}{3}$ in length to base of caudal; greatest depth 4. Dorsal rays XI, 13; A. II, 13. Lat. 1, 103.

Color in spirits, olivaceous, slightly brownish above, scarcely paler below; everywhere more or less tinged and mottled with greenish. Head everywhere thickly and closely covered with small rounded dark brown spots, largest above and on cheeks, where they are about as large as pin's heads; smaller on lips and opercles; most thickly set on the anterior part of the head. Eye thickly spotted. Spots similar to those on the head extending along upper part of back, forming a vague band, which grows narrower backward and disappears opposite front of second dorsal; front side of pectoral and first three or four dorsal spines with dark spots. Dorsal dusky olive, with darker clouds, and with some dark spots, especially on the spinous part. Caudal and anal plain dusky or faintly marbled with paler; ventrals blackish, greenish at base; pectorals dusky green.

The single specimen obtained (29,382) is 16 inches in length, being unusually large for a member of this genus. It was taken with a hook in Santa Maria Cove, in Lower California.

29,358. *Mugil brasiliensis* Ag. Mulege, L. Cal.

29,359. *Murana pinta* J. & G. (MSS.) Amortajada Bay, San Josef Island.

29,384. *Nematistius pectoralis* Gill. Piehluogo, L. Cal.

29,380. *Sparus brachysomus* Lockington. Same locality.

29,378. *Fistularia serrata* Cuv. Same locality.

29,351. *Balistes polylepis* Steind. Cape San Lueas.

29,354. *Ophichthys callisoma* (Abbott) J. & G. Same locality.

This species is probably not identical with *Ophichthys triserialis* (Kaup) Gthr.

B.—SPECIES FROM THE WEST COAST OF LOWER CALIFORNIA.

29,371. *Umbrina roncadorensis* sp. nov. Pequeña Bay.

Umbrina undulata Steindachner, Ichth. Beiträge, iii, 21, 1875, and Denkschrift. Math-Naturw. Kais. Acad. Gesell. Wien, xli, 1879, 35 (reprint); not of Girard, whose type, examined by us, is a *Menticirrhus*.

Umbrina zauti Jor. & Gilb., Proc. U. S. Nat. Mus., 1880, 456, and 1881, 43 (not of Gill).

Description.—Body moderately elongate, the back somewhat elevated, the curve from the snout to the dorsal comparatively regular; the slope behind front of dorsal also regular, but less steep. Head conical, blunt-

ish, the snout considerably protruding; mouth moderate, horizontal, the maxillary extending to behind the pupil; eye moderate, $1\frac{1}{2}$ in snout, $5\frac{1}{2}$ in head; preopercle with its bony margin finely serrate; teeth in villiform bands, the outer row moderately enlarged in the upper jaw. Gill-rakers moderate, bluntish.

Spinous dorsal rather low, the fourth spine highest, about half the length of the head. Soft dorsal long and low, its membranes scaly. Caudal lunate, its upper lobe the longer. Anal small, the second spine rather strong. $2\frac{2}{3}$ in head. Pectorals short and small, not reaching half way to vent and not nearly to tip of ventrals, their length two-thirds that of head.

Air-bladder well developed; pyloric cæca 8.

Head $3\frac{1}{2}$ in length; depth $3\frac{1}{3}$; D.X-I, 27; A. II, 7.

Lat. I. with tubes on about 55 scales; about 60 scales in a longitudinal series.

Color bright silvery, bluish above, with some brassy reflections; sides with narrow, distinct, undulating stripes of deep olive running from the head and pectoral region upwards and backwards with some abrupt curvatures to along the base of the dorsal, those below the lateral line most undulated; usually between each pair of bands are some small olive spots, often forming regular series; no distinct vertical bars, faint cross-shades rarely present; cheeks clear white; lower fins yellow; upper fins and caudal plain clear brown: peritoneum and lining membrane of opercles chiefly black.

This species is the "Yellow-finned Roncador" of the California fishermen, and occurs in abundance along the coast of California from Santa Barbara to San Diego. Its southernmost record is the present one from Pequeña Bay.

It was formerly erroneously identified by us with the related species *Umbrina xanti* Gill (= *Umbrina analis* Günther), which takes its place to the southward (Cape San Lucas, Gill, to Tumbes, Peru, Steindachner.) Specimens numbered 26,758, 26,849, and 26,864, distributed by the U. S. Nat. Mus. in 1881, as *Umbrina xanti*, are all typical of *Umbrina roncador*. (See Proc. U. S. Nat. Mus., 1881, 11.)

Umbrina roncador closely resembles *U. xanti*, but is readily distinguished by the smaller scales (lat. l. 45 to 50 in *U. xanti*), and by the color, *U. xanti* having broader and duller stripes, without the intermediate lines of dots. The peritoneum and lining of the opercle are paler in *U. xanti* and the body is deeper and less gracefully formed.

29,379. *Albula vulpes* (L.) Goode. Pequeña Bay.

29,388. *Serranus nebulifer* (Grd.) Steind. Ascension Island.

29,375. *Harpe pulchra* (Ayres) J. & G. Ascension Island.

29,369. *Caulolatilus princeps* (Jenyns) Gill. Ascension Island.

29,365. *Scorpana guttata* Grd. Ascension Island.

29,381. *Xenichthys californiensis* Steind. Cerros Island.

29,364, 29,352. *Harpe pulchra* (Ayres) J. & G. Guadalupe Island.

- 29,376. *Sebastodes auriculatus* (Girard) J. & G. San Martin Island.
 29,361. *Sebastodes serriceps* J. & G. San Martin Island.
 29,374. *Heterostichus rostratus* Grd. San Martin Island.
 29,360. *Muraena mordax* Ayres.

INDIANA UNIVERSITY, November 15, 1881.

ON THE GENERA OF CHITONS.

BY W. H. DALL.

PALÆOZOIC FORMS.

The long delay in preparing the illustrations for the monograph of the *Chitonidae* by the late Dr. Philip P. Carpenter has been the occasion of several calls from paleontologists for an abstract of the genera adopted in his revision of the fossil species. In justice to Dr. Carpenter it seems that the characteristics of the genera should be made public, the material left by him on the Palæozoic species being practically complete and ready for printing. The Mesozoic and Tertiary chitons all belong to groups represented by living species, hence the present abstract relates solely to those of earlier date. The groups of recent chitons, already reviewed by me in these Proceedings,* form the subject of the second more condensed abstract herewith.

The first fossil chiton was found by DeFrance in 1802, in the Eocene, and described by Lamarek as *Chiton grignonensis*. It was only in 1834 that a second species, *C. antiquus* Conrad, was obtained, on this occasion from the Alabama Tertiary.

The first palæozoic chitons were found in the Carboniferous rocks of Tournay, in 1836, but they were not described until 1839. Since then numerous others have been brought together and described by various authors, as well as a number of organic remains not belonging to the *Chitonidae* which have wrongly been referred to the group. Dr. Carpenter expended a large amount of time and money in examining the typical specimens in American and European museums, making several journeys for the purpose. His opinions, therefore, are entitled to great weight. Some time before his death, at his request, we went over the ground together, specimens and figures in hand, and the opinion then formed that his work is worthy of great respect, and, so far as facts are concerned, of entire confidence, has not been changed by my subsequent study of his incomplete manuscripts.

An excellent digest of the history of fossil chitons to date of publication was given by De Koninck in 1857,† which was translated for the Annals and Magazine of Natural History, of August, 1860, by W. H. Baily.

*Vol. i, pp. 281-344, 1878.

†Bull. Acad. Roy. des Sciences de Belgique, 1857.